Troponin I in cardiac surgery: Marking the future

Mark F. Newman, MD Durham, NC

See related article on page 447.

Coronary artery bypass grafting and valvular surgery have become extremely safe procedures with patients now undergoing operations well into the ninth decade.1 Despite the substantial advances in anesthetic management, surgical techniques, and myocardial preservation that has led to this continued improvement in morbidity and mortality, myocardial injury continues to occur in association with cardiac surgery. Although the incidence of this complication related to risk has declined,2 the risk (increasing age, comorbidities, and lower ejection fraction) has increased to maintain a perioperative myocardial infarction rate of 7% to 15%.3,4

The previous gold standard marker of myocardial infarction was CK-MB isoenzyme used both in cardiac surgery and in acute coronary syndromes to aid in the diagnosis of myocardial infarction. However, the sensitivity and specificity of this marker has been demonstrated to be reduced compared with the new assessments of troponin levels (troponin T, cTnT; troponin I, cTnI).5-12 Can these gold standards be improved through advanced laboratory technology? Greenson et al continue this ongoing question in their accompanying article defining “the usefulness of cTnI in clinical practice, and even greater variability in predicting myocardial damage assessed by other end points. However, the demonstration that cTnI was extremely high in shed blood and that the return of this blood to the patient could artificially elevate levels is an important issue for further study.”9 The results of both studies may be predictable by the time frame in which each measured cardiac markers. By excluding early assessment and concentrating on the late follow-up Greenson et al enhanced the probability that cTnI and not CK-MB would have the larger predictive power because peak levels of CK-MB could have been missed.

References

If the substantial improvement in sensitivity and specificity and excellent correlation with perioperative complications demonstrated by Greenson et al can be confirmed in larger trials and the conflicting results from Horvath resolved, cTnl would be a substantial advancement in the science of assessing myocardial injury associated with cardiac surgery. A number of important issues related to standardization of this measurement have been addressed in editorials elsewhere and must be considered as adoption of this technique as the routine approaches.

The unanswered question is the value of the data in caring for our patients. Because there is a significant correlation between ECG and echocardiography-assessed myocardial injury with cTnl, it has become increasingly evident that cTnl may be the marker of choice to assess myocardial injury in ongoing clinical trials of myocardial protection. Demonstrated reduction of cTnl with clinical or pharmacologic intervention-based studies would be expected to improve hospital outcomes with additional trials necessary to determine how these factors relate to longer-term myocardial outcome and mortality. However, the value in clinical practice remains to be determined on the basis of our ability to predict individuals at high risk who require additional intensive monitoring, or therapy. Further, we must determine our ability to alter the progression of events through pharmacologic or other interventions to prevent the secondary outcomes associated with the perioperative myocardial injury demonstrated by elevated cTnl. Although the later peak associated with cTnl is not a limitation for assessment of myocardial injury in clinical trials, the importance of this delay in making available information for intervention will need to be determined. It may be that the gold standard for determination of myocardial injury varies by the period of measurement or that multiple markers with varying degrees of sensitivity and specificity by timing of release may provide a better measure. If cTnl can be an indicator of the need for further intervention to reduce long-term morbidity and mortality, it could be of substantial importance in helping us make a safe procedure even safer.

References